

Report about Solar Workstations

1. Executive Summary

Objective of the Report: This report provides an analysis on the implementation of solar systems in public spaces, covering best practices, case studies, potential suppliers and financing sources available to encourage the adoption of renewable energy in urban areas.

1. Literature Review: The research reviews various publications on the integration of photovoltaic systems in public spaces. The environmental, social and economic benefits of these systems are highlighted, such as reducing the carbon footprint, reducing the operating costs of cities and promoting sustainability. Technical and financial challenges related to its installation are also identified, such as variability in energy production and initial costs.

Likewise, the public policies and regulatory frameworks that have favored the adoption of solar technologies in urban environments are analyzed, presenting examples of successful projects worldwide.

2. Case Studies: The report examines various case studies of cities and universities that have implemented solar systems in public spaces. In each one, the benefits of these projects are highlighted, both in terms of energy efficiency and in improving the quality of urban life.

3. Potential Suppliers: The report presents a list of prominent solar technology suppliers. Companies are mentioned that offer innovative solutions adapted to the different needs of public spaces, ranging from solar panels to energy storage systems.

4. Financing Sources: Various financing sources are identified that could facilitate the execution of these projects, such as:

- Public funds and government subsidies: Many governments provide incentives and subsidies to encourage the adoption of renewable energy in urban projects.
- International initiatives and NGOs: Organizations such as the World Bank and the Green Climate Fund have specific programs aimed at renewable energy projects in cities.
- Private investment and public-private partnerships (PPP): The benefits of PPPs are highlighted as an alternative to finance the energy transition in public spaces without affecting government budgets.

Conclusions: The report concludes that the implementation of solar systems in public spaces not only helps achieve the sustainability objectives of cities and universities, but also provides long-term economic benefits, by reducing operating costs and promoting responsible use of energy. energy resources. The success of these projects depends on collaboration between governments, companies and communities, as well as the identification of appropriate financing sources for their implementation.

2. Literature Review

In recent years, numerous universities in the United States have implemented solar projects on their campuses, particularly in public spaces such as building rooftops, parking lots, and other open spaces. These projects not only contribute to sustainability goals, but also serve as key educational outlets for students and the community at large, showcasing how solar energy can be used on a large scale. Below are some notable case studies on solar projects in public spaces at universities in the US:

1. University of California, Los Angeles (UCLA)

UCLA has implemented one of the largest solar initiatives on a university campus in California. The university has installed solar panels on

building rooftops, in parking lots, and on various campus facilities. One of the most representative projects was the installation of solar panels in the central parking lot of the campus, creating solar shade structures.

Impact: These projects not only provide renewable electricity, but also provide shade for vehicles, which is crucial in a city as hot as Los Angeles. Solar panels on parking lots generate a large amount of energy that helps reduce the university's energy costs and advance its sustainability goals.

2. University of Arizona

The University of Arizona has been a leader in the use of solar energy, given its location in the desert, where solar irradiation is especially high. The university has installed solar panels on building roofs and implemented solar carports in parking lots, which not only provide clean energy, but also shade in the region's hot climate.

Impact: The university has significantly reduced its non-renewable energy consumption and made progress toward its sustainability goals. The solar panels generate energy that is used in several facilities on campus, and the project has served as a model for other universities.

3. North Carolina State University (NC State)

NC State has taken a comprehensive approach to integrating solar energy on its campus. The university has installed solar panels on building roofs, parking lots, and other public areas. In particular, one of the largest projects is the installation of solar panels on the university's central parking lot.

Impact: Solar energy generated by the solar panels installed on campus helps reduce conventional energy use, improving the campus's energy efficiency. Additionally, the project serves as a living laboratory for solar energy research and education.

4. Duke University

Duke University has been a pioneer in the use of solar energy on campus, with several projects including rooftop solar installations on buildings and parking lots. One of the most notable projects is the solar

carport in the university's parking lot, which covers one of the largest areas on campus.

Impact: The university has achieved a significant reduction in its carbon emissions thanks to solar energy generated on campus. The solar projects also serve as educational and research sites for renewable technologies.

5. University of Michigan

The University of Michigan has installed solar panels on several buildings on campus, as well as in public spaces such as the parking lot. The university has a commitment to sustainability and clean energy, with the goal of reducing greenhouse gas emissions and becoming carbon neutral.

Impact: The energy generated by these solar systems contributes significantly to the energy needs of the campus. In addition, solar projects have a strong educational component, as they are used as learning platforms for students in areas of engineering and environmental science.

6. Stanford University

Stanford is known for its leadership in sustainability and has implemented several solar projects across campus. A key example is the installation of solar panels in parking lots and on key buildings, including some administrative and academic buildings.

Impact: Solar projects have allowed Stanford to reduce its carbon footprint and move toward its goal of 100% renewable energy. Additionally, Stanford uses these projects as research opportunities in the area of clean energy.

7. University of California, San Diego (UCSD)

UCSD has implemented a solar system in the parking lot as part of its initiative to reduce conventional energy consumption and move toward its sustainability goals. The system includes solar panels on shade structures, allowing electricity to be generated while providing shade for vehicles.

Impact: This project helps UCSD reduce its carbon footprint and energy costs. Additionally, the university uses these projects to promote renewable energy research and education.

In Texas, several universities have implemented solar projects on their campuses as part of their efforts to promote sustainability and clean energy. Here are some notable case studies of solar projects in public spaces within Texas universities:

1. University of Texas at Austin (UT Austin)

UT Austin has been at the forefront of adopting solar energy. One of the most visible projects is the installation of solar panels on the campus bus station, which is combined with other solar systems on different buildings. This project aligns with the university's strategy to reach carbon neutrality by 2030.

Impact: The solar panels contribute to generating renewable energy for nearby buildings and reduce CO2 emissions, as well as improving the energy efficiency of the campus. This initiative is part of a broader sustainability effort that includes the installation of solar roofs on several buildings on campus, such as the library and research centers.

2. Texas A&M University

Texas A&M has developed a large-scale solar farm on its main campus in College Station. This project includes an array of solar panels installed on land near the campus, allowing the university to generate a significant portion of its electricity from renewable sources.

Impact: This project is one of the largest of its kind in Texas and provides clean energy not only to campus buildings but also contributes to the local power grid. It also contributes to reducing the carbon footprint of the university, which has committed to achieving carbon neutrality by 2050.

3. University of Houston

The University of Houston has implemented several solar systems on its campus, including solar roofs on key buildings such as the College of

Engineering and athletic facilities. The goal is to provide renewable energy for campus facilities while also promoting research and development in clean energy.

Impact: The solar system installed at the College of Engineering has allowed this building to operate partially on solar power, which also serves as an educational space for students interested in renewable energy. The campus has a goal of reducing its greenhouse gas emissions, and these solar projects contribute significantly to that goal.

4. Texas State University

Texas State University installed solar panels at several locations on its San Marcos campus, including the roof of key buildings and parking areas. This project aims to improve the campus's energy efficiency and reduce its reliance on conventional energy.

Impact: The solar panels generate electricity that is used directly on campus, helping to reduce operating costs and contributing to the university's sustainability goals. Additionally, the campus promotes the use of these solar installations for educational purposes, allowing students to learn about renewable energy and solar technology.

5. Rice University

Rice University in Houston has installed several solar systems in different areas of the campus, including solar roofs on academic buildings and research centers. The university has also integrated energy storage technology to optimize the distribution of energy generated throughout the day.

Impact: These solar systems have allowed the university to reduce its consumption of electricity from the grid and decrease its carbon footprint. Additionally, Rice University is known for its focus on renewable energy research and has used these solar projects for educational and clean energy research purposes.

6. University of Texas at El Paso (UTEP)

UTEP implemented an innovative system of "solar carports" in parking areas on campus. This type of installation not only generates solar energy, but also provides shade for parked vehicles.

Impact: Solar panels installed on parking structures provide power for nearby buildings, helping to reduce energy costs and improving student and staff comfort by providing shade in parking lots. This project also has an educational impact, as UTEP uses its solar installations to teach students about solar energy and its integration into urban infrastructures.

3. Comparison of Models and Vendors

ITEM	UNIT PRICE	DESCRIPTION
SUNBOLT Solar workstation	\$8650 (starting price)	\$8650 is the starting price per unit. Added upgrades, modifications would change cost. Includes : Two benches, ADA Accessible Seating , 120V and USB/USB-C Fast Charging , Outlets plus Qi Wireless Charging Pads, 1.4kW Solar Array . More information : https://gosunbolt.com/
SUNBOLT Carousel (4-seater)	\$9000 (starting price)	\$8650 is the starting price per unit. Added upgrades, modifications would change cost. ncludes : USB Outlet and Battery Voltemeter, Table & Seating, Parasol https://gosunbolt.com/
Solar Charging Station with Ring	\$2597 (starting price)	Includes : 4 standard USB ports Plus 2- Apple Lighting & 2- Android USB-C Cords 2.1 amp fast charge 100-watt solar panel https://kaypark.com/product/solar-charging-station-with-ring/
SELS Solar Charging and Connectivity Station	(awaiting quote)	Includes : outdoor furniture, device charging and lighting. For more information : https://selsled.com/products/stag-table-solar-charging-and-connectivity-station

Solarena Engineering EVODIA Solar Worktables	(awaiting quote)	Includes : 300 W Solar Panel & 2 x 210-315 AH Battery Storage , Four (4) 11V AC Power Outlets and Four (4) USB Outlets, ADA Compliant seating, seats four (4) comfortably For more information : https://www.solarena-engineering.com/solar-powered-workstations/ https://www.solarena-engineering.com/_files/ugd/daa811_8cb491f7120b4d94ba2904884926f9a4.pdf
Powerstack	\$6,000	The solar poles were powerful enough to provide 24/7 uptime for 4-way charging stations, seamlessly integrated into the pole design. https://powerstack.energy/usa/
LUMOS Solar Workstations	\$20,000	SolarZone Capacity - Lights on for 8 hours , Four hours of wireless phone charging per day , Eight hours of computer charging per day. More information : https://lumossolar.com/wp-content/uploads/2021/07/2021-SolarZone-FAQ.pdf

4. Evaluation of Funding Mechanisms and Grants

- EPA Changemakers Grant: Can be a key source of funding for projects focused on sustainability and clean energy in vulnerable communities.
- Solar for All Initiative: Provides grants and financial incentives for the installation of solar systems in low-income areas and on public properties.
- Smaller Local Grants and Foundations: Research local environmental grants and foundations in Houston, like the Houston Endowment, which supports green infrastructure and renewable energy projects. Collaboration Opportunities: Explore partnerships with local utility companies, corporate sponsorships, or community organizations for joint funding.

- Texas Energy Efficiency Grant Program: Funds projects that promote energy efficiency in local communities.
- Energy Efficiency and Conservation Block Grant (EECBG)

5. Additional Considerations

Appropriate signage at solar stations in public spaces within a university is essential both to encourage the use of solar energy and to educate the university community about the benefits and operation of these technologies. Signage must be clear, educational, accessible and aligned with the institution's sustainability values and objectives. Below are some key recommendations for designing effective signage at solar stations in a university environment.

1. Include Clear and Concise Educational Information

Objective: Increase understanding of solar energy and its importance within the framework of sustainability.

It is necessary to include a brief explanation of what solar energy is, how it works, and how it is used at the specific solar station. It is possible to add data such as:

- The amount of energy generated by the installed solar panels.
- How many homes could be supplied with that energy.
- The environmental impact of the energy produced (for example, the reduction of CO₂ emissions).

2. Use Clear and Accessible Language

It is important to avoid excessive use of technical jargon and opt for simple language. If it is necessary to use technical terms, include a glossary or a brief explanation next to these terms.

3. Offer Interactive and Visual Information

It is important to use graphics, icons and interactive screens that show in real time: The energy produced during the day (in kWh), estimation of CO₂ reduction compared to traditional energy sources, the amount of energy stored or used on campus. A good option is to use QR codes to redirect

users to additional online content, such as educational videos, infographics, or a campus sustainability page.

4. Design Signage to be Attractive and Aligned with the University's Visual Identity

It is important to ensure the sign's visual elements (colors, fonts, logos) are in harmony with the university's branding. Incorporate green, blue, and orange hues, commonly linked to sustainability and clean energy.

5. Include Responsible Use Information

It is important to make sure to include clear reminders about how users should interact with solar infrastructure, such as access restrictions (e.g., do not touch solar panels) and prohibition of vandalism.

6. Incorporate Environmental Commitment Messages

It is important to use signage to inspire student and campus community commitment to sustainability.

7. Strategic Placement of Signs

It is important to place signs in visible, high-traffic locations, such as near main entrances, transportation stations, and rest areas. Also, make sure they are easy to read from moderate distances and are well-lit so they are visible at any time of day.

8. Use QR Codes and Links to Digital Resources

It is important to place QR codes on signs to allow users to access more digital information, such as real-time data on solar energy generation, educational videos on how solar energy works, links to research projects or events related to sustainability at the university.

9. Encourage Student Involvement

It is important to use signage as an educational platform that invites students to participate in solar-related activities or initiatives.

6. Conclusion

Summarize the key recommendations and next steps for decision-makers at TSU to take the project forward, including conducting a pilot project, securing funding, and selecting the final vendor.